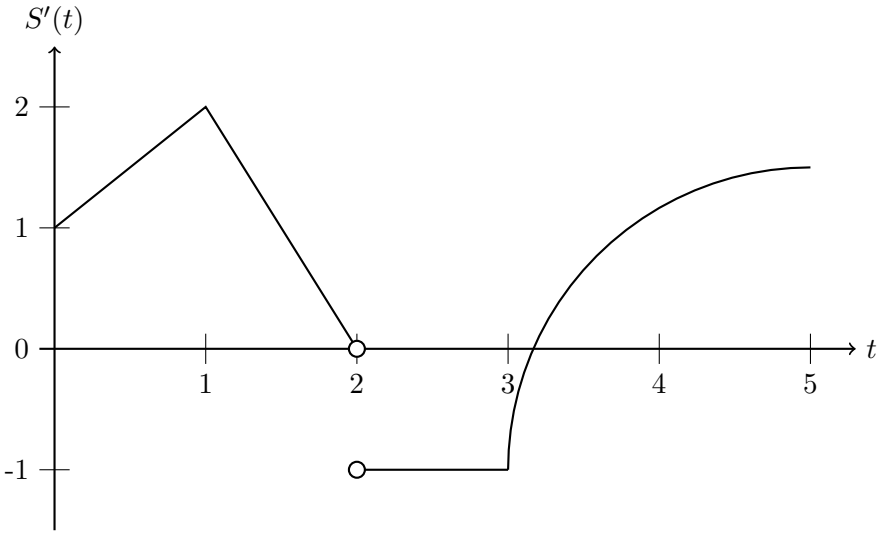
**2**. [16 points] The local sparrow population has been fluctuating unnaturally, and Raymond Green has five months of data to prove it. Let $S(t)$ denote the local sparrow population **in thousands**, $t$ months after Green started collecting data. A graph of $S'(t)$, the rate of population growth, is below. Assume there are 2000 sparrows at $t = 1$.




**a**. [1 point] At which $t$-value(s) is the sparrow population increasing the fastest?

*Solution:* The population is increasing fastest at $t = 1$.

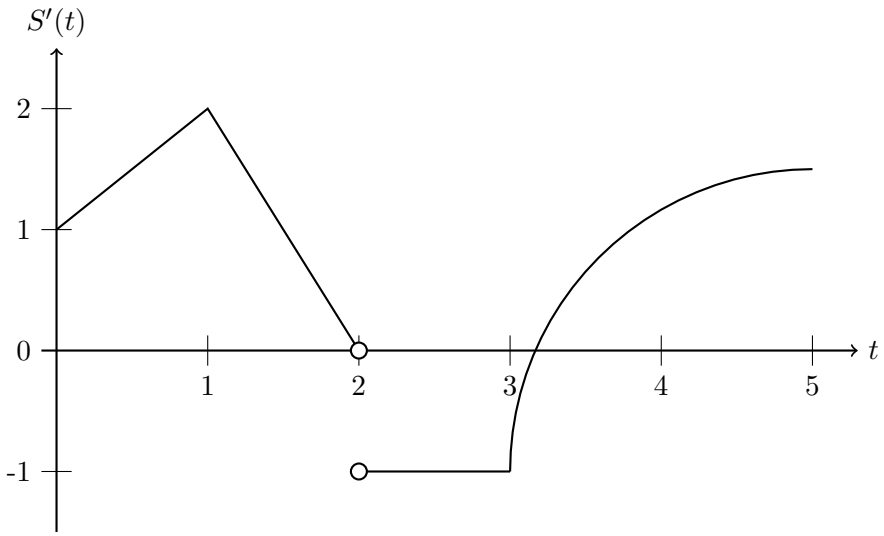
**b**. [3 points] What is the local sparrow population at $t = 0$, $t = 2$ and $t = 3$?

*Solution:* The population is 500 at $t = 0$, 3000 at $t = 2$, and 2000 at $t = 3$.

**c**. [2 points] At which $t$-values is the population at its highest and lowest?

*Solution:* The population is highest at $t = 5$ and lowest at $t = 0$.

**2 (continued).** Recall that $S(t)$ is the local sparrow population **in thousands**, $t$ months after Green began collecting data.




**d**. [10 points] Sketch a graph of $S(t)$ on the axes below, recalling that there are 2000 sparrows at $t = 1$. Label your vertical axis. Make sure that concavity and local extrema are clear.

*Solution:*